

Claims

What is claimed is:

- [c1] A method for transparently injecting a proxy into a distributed application having a server portion and a client portion, comprising:
 - creating the proxy that implements an interface of a remote object in the server portion and has a capability to cache data from the remote object;
 - modifying the client portion to substitute a call for the remote object with a call for the proxy; and
 - interposing a client runtime that includes the proxy between the client portion and the server portion.
- [c2] The method of claim 1, further comprising:
 - interposing a server runtime between the client runtime and the server portion that enables interaction between the client runtime and the server portion.
- [c3] The method of claim 2, further comprising:
 - sending a message to the server runtime to fetch data from the remote object.
- [c4] The method of claim 3, further comprising:
 - receiving data fetched by the server runtime and caching data in the proxy.
- [c5] The method of claim 4, further comprising:
 - sending a message to the server runtime to synchronize data cached in the proxy with data in the remote object.
- [c6] The method of claim 2, further comprising:
 - sending a message to the server runtime to invoke a method of the remote object on behalf of the proxy.

- [c7] The method of claim 6, further comprising:
receiving a result of invoking the method of the remote object from the server runtime
and passing the result to the proxy.
- [c8] A method for transparently injecting a proxy into a distributed application having a server portion and a client portion, comprising:
creating the proxy for a plurality of remote objects in the server portion, each proxy implementing an interface of a corresponding remote object and having a capability to cache data from the corresponding remote object;
modifying the client portion to substitute a call for a remote object with a call for a corresponding proxy; and
interposing a runtime that includes the proxy between the client portion and the server portion.
- [c9] The method of claim 8, wherein creating the proxy for the plurality of remote objects in the server portion comprises analyzing the server portion to determine the remote objects in the server portion.
- [c10] The method of claim 9, wherein analyzing the server portion comprises parsing machine code for the server portion.
- [c11] The method of claim 9, wherein analyzing the server portion comprises parsing a descriptor containing a list of classes in the server portion.
- [c12] The method of claim 9, wherein analyzing the server portion comprises parsing source code for the server portion.
- [c13] The method of claim 8, wherein modifying the client portion comprises modifying machine code for the client portion.
- [c14] The method of claim 8, wherein modifying the client portion comprises modifying source code for the client portion.

- [c15] The method of claim **8**, further comprising:
modifying the client portion to substitute a call to a first lookup service that locates the remote object with a call to a second lookup service that locates the corresponding proxy.
- [c16] The method of claim **15**, wherein the lookup service that locates the corresponding proxy is included in the runtime.
- [c17] The method of claim **8**, further comprising:
modifying the client portion to substitute a call to manage a lifecycle of the remote object with a call to manage a lifecycle of the corresponding proxy.
- [c18] The method of claim **8**, further comprising:
fetching data from the remote object into the proxy associated with the remote object.
- [c19] The method of claim **18**, further comprising:
synchronizing data in the proxy with data in the remote object associated with the proxy.
- [c20] The method of claim **8**, further comprising:
invoking a method of the remote object on behalf of the proxy associated with the remote object.
- [c21] The method of claim **20**, further comprising:
receiving a result of invoking the method of the remote object and passing the result to the proxy.
- [c22] The method of claim **8**, wherein the runtime includes a client runtime that interacts with the client portion and a server runtime that interacts with the server portion.
- [c23] The method of claim **22**, wherein the client runtime and server runtime communicate in order to enable interaction between the client portion and the server portion.

- [c24] A method for transparently injecting a proxy into a distributed application having a server portion and a client portion, comprising:
- analyzing the server portion to find each remote object in the server portion;
- creating the proxy for each remote object in the server portion and including the proxy in a runtime library;
- analyzing the client portion to determine calls made to remote objects in the server portion and replacing calls for remote objects with calls for a corresponding proxy; and
- interposing the runtime library between the client portion and the server portion.
- [c25] A method for optimizing a distributed application having a server portion and a client portion, comprising:
- interposing a runtime between the client portion and the server portion, the runtime comprising at least a proxy associated with a remote object in the server portion, the proxy having a capability to cache state information from the remote object;
- enabling the client portion to interact with the proxy;
- fetching data from the remote object into the proxy; and
- synchronizing data in the proxy with data in the remote object.
- [c26] A computer-readable medium having recorded thereon instructions executable by a processor, the instructions for:
- generating a proxy for a remote object in a server and making the proxy available to a client;
- fetching data from the remote object into the proxy; and
- returning data in the proxy to the remote object.
- [c27] The computer-readable medium of claim 26, wherein returning data in the proxy to the remote object comprises returning data modified by the client to the remote object.
- [c28] The computer-readable medium of claim 26, further comprising:
- instructions for updating data in the remote object with data in the proxy.

- [c29] The computer-readable medium of claim 26, further comprising:
instructions for invoking a method of the remote object on behalf of the proxy.
- [c30] The computer-readable medium of claim 29, further comprising:
instructions for returning a result of invoking the method of the remote object to the proxy.
- [c31] A computer-readable medium having recorded thereon instructions executable by a processor, the instructions for:
analyzing a server portion of a distributed application to find each remote object in the server portion;
generating a proxy for each remote object in the server portion; and
including the proxy for each remote object in the server portion in a runtime library.
- [c32] The computer-readable medium of claim 31, further comprising:
instructions for modifying a client portion of the distributed application such that a call for a remote object is replaced with a call for a corresponding proxy.
- [c33] An optimizer for a distributed application, comprising:
means for creating a local proxy for a remote object in the distributed application;
means for fetching data from the remote object into the local proxy; and
means for synchronizing data in the local proxy with data in the remote object.
- [c34] The optimizer of claim 33, further comprising:
means for invoking a method of the remote object on behalf of the local proxy.
- [c35] The optimizer of claim 34, further comprising:
means for receiving a result of invoking the method of the remote object and passing the result to the local proxy.
- [c36] The optimizer of claim 33, further comprising:
means for packing data for transport between the local proxy and the remote object.